User-friendly portable poolside video analysis

User-Friendly Portable Poolside Video Analysis

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INTRODUCTION

Video based analysis of swimming technique has been limited by a lack of portability of camera and playback systems, difficulties of setting stable camera views, poor quality of images, cumbersome file management and playback, and affordability. Since 2002, the aim of this project was to develop a portable coach friendly system that empowers coaches to conduct qualitative analysis at their own pools. A second aim was to enable data collection for quantitative 2D and 3D analysis in any location. This avoids travelling costs of coaches and swimmers and disruption to swimming programmes.

METHODS

To address the limitations of other systems the minimum operational requirements of the following components of the system were specified: Cameras; waterproof holding boxes; control and storage PC; 'touch screen'; software integrating control of camera functions and camera views, capture, playback of one or two camera views concurrently; portable storage in a case. Testing of the requirements was conducted at the Centre for Aquatics Research and Education. A prototype system was demonstrated at the Scottish Institute of Sport and during the poolside demonstration section of the Swimming Applied Programme of the ISBS 2009 conference. Based on feedback from those exhibitions the system has been modified to include minor changes to the software and improvements in portability.

RESULTS

The system developed has the following main features: High quality wide-angle lens with up to 12x optical zoom; integrated pan and tilt; low distortion throughout the wide-zoom range; remote controlled camera functions including aperture, shutter speed, and gain; waterproof holding boxes with low distortion perspex window, simple and effective mechanism for attaching to pool walls or floor, stable position suitable for use in 3D analysis, neutral buoyancy to enable ease of positioning under the water, dimensions optimal to enable adequate pan and tilt, waterproof cable exit; control and storage PC enabling control of either one or two cameras, large file storage, and file management; touch screen'; user-friendly software that integrates control of camera functions and camera views, capture, playback of one or two camera views concurrently, real time video preview, playback with slow motion, simple data base entry and file retrieval; simple file management, retrieval and download; portable storage in a standard size travel case with hard exterior, handle, and wheels. The errors in 3D reconstruction using two systems in combination (four cameras) compared favourably with similar systems (Machtsiras and Sanders, 2009).

DISCUSSION

This system developed meets the requirements specified and therefore eliminates the limitations common in other systems. As a consequence coaches have an affordable qualitative analysis system that can be used readily in any pool. The system is also suitable for 2D and 3D quantitative research and enables researchers to collect high quality quantitative data at any pool.

REFERENCES

Machtsiras G. & Sanders R.H. (2009). Accuracy of a (PTZ digital) camera system designed for aquatic three-dimensional analysis. Proceedings of the 27th International Symposium on Biomechanics in Sports. University of Limerick, Ireland. Pp.: 460.